



Water Scarcity

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INTRODUCTION

In this lesson, students will learn about water scarcity and how much of the earth's water is actually available for daily human use. By examining situations in various countries, students will learn the high demand for water around the globe, and compare the ways in which it is distributed and used in different countries.

LESSON OVERVIEW

Grade Level and Subject: Grades 2-4: Social Science and Language Arts

Length: One long or two short class periods (Class #1 will be dedicated to discussion of water use and scarcity, and students will begin research on their countries. Class #2 will be dedicated to presentations about each country and an activity to explore water usage by country).

Objectives:

After completing this lesson students will be able to:

- Understand the problem of water scarcity around the globe
- Identify and locate countries and continents on a map
- Compare and contrast different countries and their access to water
- Understand how they can conserve water

National Standards Addressed:

This lesson addresses the following National Education Standards¹:

- **Content Standard:** [NSS-G.K-12.1 THE WORLD IN SPATIAL TERMS](#)
As a result of activities in grades K-12, all students should
 - Understand how to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective.
 - Understand how to use mental maps to organize information about people, places, and environments in a spatial context.
 - Understand how to analyze the spatial organization of people, places, and environments on Earth's surface.
- **Content Standard:** [NSS-G.K-12.2 PLACES AND REGIONS](#)

¹ Education World (2008) *U.S. National Education Standards*. Retrieved January 27, 2009, from <http://www.education-world.com/standards/national/index.shtml>.

As a result of activities in grades K-12, all students should

- Understand the physical and human characteristics of places.
- Understand that people create regions to interpret Earth's complexity.
- Understand how culture and experience influence people's perceptions of places and regions.

- **Content Standard:** [NSS-G.K-12.5 ENVIRONMENT AND SOCIETY](#)

As a result of activities in grades K-12, all students should

- Understand how physical systems affect human systems.
- Understand the changes that occur in the meaning, use, distribution, and importance of resources.
- Understand how human actions modify the physical environment.

- **Content Standard:** [NL-ENG.K-12.8 DEVELOPING RESEARCH SKILLS](#)

Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

Materials Needed:

Class #1

- Reproducible #1- **Water Usage Worksheet**
- 4 liters of water, or a liquid of your choice (Use juice or turn into Koolaid, etc. if you want to make it a snack when you're done!)
- Measuring cup
- Globe or map
- Ice cube tray
- Research tools (Computers, atlases, encyclopedias etc.)

Class #2

- Large World Map
- Reproducible #2- **Discover a Country**
- Gallon container (ie milk jug) for display
- 11 copies of Reproducible #3- **Circles for Counting** OR save paper by collecting 601 items for counting (could be M&Ms, pennies, goldfish, paperclips etc.)

Assessment:

Students will be assessed through the following activities:

- Completion of take-home pre-assignment
- Presentation of their country and location on World Map
- Participation in discussion questions and activities

LESSON BACKGROUND

Conversion Information:

- 1 U.S. liquid gallon is equal to 3.785411784 litres/liters
- 1 U.S liquid gallon is equal to 128 fluid ounces
- 1 cubic meter is equal to 264.172052 US gallons

- 1 kilogram is equal to 2.20462262 pounds

Relevant Vocabulary:

- **Conservation:** Preservation and protection of materials or resources
- **Scarcity:** Deficient amount of something to meet the demands; not plentiful or abundant
- **Climate:** the average condition of the weather at a place usually over a period of years as exhibited by temperature, wind velocity, and precipitation
- **Glaciers:** A large body of ice, usually found in elevated or mountain areas and at the north and south pole

Information:

Water is one of earth's most valuable resources, and one of its most scarce. Out of the earth's total supply of water, 97% is salt water and only 3% is fresh water. Furthermore, the amount of fresh water trapped in glaciers and icecaps is 2.2%, leaving only 0.8% of the earth's total water available for everyday human use.

Water is necessary for survival, but some parts of the world have better access to clean, easily attainable water than others. In some countries obtaining water is as simple as turning on the faucet, while in other places women and children must walk miles everyday for fresh water. In addition to variations in the allocation of resources across the world, there can still be inequality even within each country. Depending on distribution, governance and resource management, even regions with plenty of access to water can have portions of their population facing water scarcity issues, and vice versa. Water sanitation is also an issue, as filthy water can lead to disease and even death. For these reasons, it is important to realize that the entire earth shares a small percent of fresh water, and it is vital that this resource be protected and conserved.

Resources:

- Information on water all across the world: National Geographic (2009) *Signs and Solutions*. Retrieved January 27, 2009 from <http://www.nationalgeographic.com/signsandsolutions>
- Information on why you cannot use salt water in replacement of fresh water: U.S. Geological Survey (2008) *Thirsty? How 'Bout a Cool, Refreshing Cup of Seawater?* Retrieved January 27, 2009 from <http://ga.water.usgs.gov/edu/drinkseawater.html>
- U.S. Geological Survey (2008) *Water Science For Schools*. Retrieved January 27, 2009 from <http://ga.water.usgs.gov/edu>
- Earth Day Network (2009) *Global Water Statistics*. Global Water Network: Retrieved February 17, 2009 from <http://www.globalwaternet.org/>

Preparation Work:

Once the 601 objects have been collected (or copies of Reproducible #3- **Circles for Counting** have been made), it may be helpful to have them pre-sorted according to the information below. (Each counting item counts as one gallon of water.) Place the allotted amount in a pile, box or baggie designated for each country. (*Example: the box marked "United States" gets 150 circles/pennies/paperclips etc.*)

- United States- 150 gallons per person/per day
- Norway- 79 gallons day/per person/per day
- Kenya- 12 gallons per person/per day
- India- 35 gallons per person/per day
- Australia- 130 gallons per person/per day
- Mexico- 96 gallons per person/per day
- Brazil- 49 gallons per person/per day
- Germany- 50 gallons per person/per day

LESSON STEPS

Pre-Assignment: *Water Usage Worksheet*

1. Send students home with Reproducible #1 – **Water Usage Worksheet** so they can begin to think about the amount of water they use each day.

Warm Up: *Why is Water Important?*

1. Begin the lesson by discussing with students what water is used for and why it is so important. Have them look at their **Water Usage Worksheet** homework assignment and guide the discussion with the questions below:
 - a) Why do we need water? (*ex. We cannot survive without clean water to drink every day. We also depend on water for many other things in our daily lives, in addition to agriculture, industry, etc.*)
 - b) What type of activities is water used for? Where and when do you use water the most?
 - c) Where do you think the water that you use comes from?
 - d) Do you think it is possible to run out of water?
 - e) What would happen if our water supply was reduced?

Activity One: *Measuring Available Water Supplies*

1. Show students a globe or map, and point out all the water on Earth. Explain that even though our “blue planet” is covered with mostly water, 97% of water on earth is salt water in the oceans and cannot be used for human consumption, agriculture, etc.
2. Show the 4 liters of liquid to the students and tell them that it represents all of the water on Earth. Ask students to estimate how much of the 4 liters they think is fresh water available for human use.
3. Explain to students that 97% of water on earth is salt water and cannot be used for human consumption, agriculture, etc.
4. Pour 120ml into the measuring cup to represent the 3% of fresh water that exists on the earth. Ask students to notice how little the amount is in comparison to the rest of the liquid left in the gallons.

5. Using the cup of liquid you just poured, explain to students that 2.2% of Earth's water is locked up in glaciers and unavailable for use, and less than 1% (only 0.8%) of it is actually available for everyday use from rivers and lakes. Pour 88ml of the cup into the ice cube tray to signify that it is frozen water.
6. The liquid remaining in the measuring cup (32ml) is a representation of the amount of water available for human use out of Earth's total water supply. Ask students to compare the amount of liquid left in the measuring cup to the amount in the liter containers. Lead a discussion on their reaction. Was the amount more than they thought? Less? Also ask students to consider what else that water is used for besides personal use (*agriculture, plumbing, industry, etc.*).

Activity Two: *Research Your Country*

1. Explain to students that everyone in the world has to share this small bit of fresh water. For the rest of the class period, they will be researching different countries around the world, and they should keep water use in mind while doing their research.
2. Split students into 8 groups and assign each group one of the following countries to learn more about: United States, Norway, India, Australia, Kenya, Mexico, Brazil, and Germany. Give students a copy of Reproducible #2- **Discover a Country**, to guide their research. Students can work in groups or individually to do research, using the internet, atlases, encyclopedias, etc. Additional research can be done at home as homework.

Activity Three: *Do All Countries Have Equal Access to Water?*

1. Bring out the large map of the Earth and ask each group to present their country. Have them point out the location of the country and tell their classmates what continent it is on, what the climate is like there, and their fun fact.
2. For each group presentation, ask the class questions on how they think water access for that country differs from other parts of the world. Their answers should be based on their research, and also group brainstorming to make educated guesses. For example, how much rainfall do they get? (*A dry country like Kenya would have more frequent droughts than much of the United States, which gets more precipitation*) Where does their water come from (*lake, river, the faucet, etc.*)? Do they have plumbing or sanitation systems? Is pollution a problem? (Note: See the National Geographic website under resources for an overview of water problems around the world).
3. Hold up the measuring cup of available water in the world and compare it again to the amount of un-usable water. Remind students that the small percentage in the measuring cup is the amount that everyone on the earth has to share. Explain that this water is a limited resource because the Earth never produces any more than what it already has, it just keeps cycling through (*rain, ice, ocean, evaporation, etc.*). In other words, we're drinking the same water that dinosaurs did millions of years ago!

Activity Three: *Who Gets to Use What?*

1. Show the gallon container to students to make sure they understand how much

this is. (Note: Students may be more familiar with gallons or liters; if you would like to convert the measurements in this exercise to liters [1 U.S. liquid gallon is equal to 3.785411784 litres/liters], be sure to also indicate to students what this amount looks like!)

2. Have students sit in groups according to their countries. Each group will get 1 counting item for every gallon of water an average person uses per day in their country. Pass out allotted counting objects (see “Preparation Work” section), or have students count out how many items their country gets based upon the following²:
 - United States- 150 gallons per person/per day
 - Norway- 79 gallons day/per person/per day
 - Kenya- 12 gallons per person/per day
 - India- 35 gallons per person/per day
 - Australia- 130 gallons per person/per day
 - Mexico- 96 gallons per person/per day
 - Brazil- 49 gallons per person/per day
 - Germany- 50 gallons per person/per day
3. Once students have the correct number of objects, ask them to look around and compare how many items they have in comparison to other countries. Who has the most? Who has the least? Why do they think that is?
4. Using the amounts below, students should decide as a group how they want to spend their daily water allowance³. Have them take away the items as they are used up so they can visualize how much is left. Students will need to think about what they really need to use their water for, especially in countries that do not have very much.
 - Bath: 50 gallons
 - Shower: 2 gallons per minute
 - Teeth brushing: 1 gallon
 - Hands/face washing: 1 gallon
 - Dishwashing by hand: 5 gallons/load
 - Clothes washing (machine): 10 gallons/load
 - Toilet flush: 3 gallons
 - Glasses of drinking water: 8 oz. per glass (1/16th of a gallon)

Discuss with students what they think are the most important things to use their water allotment on. Also ask them if there are alternative choices to items on this list. For example, using an outhouse or latrine, washing out of a bucket instead of using running water, hand-washing clothes in a tub, etc. Have them examine what

² Data 360 (2006) *Average Water Use Per Person Per Day*. Retrieved January 27, 2009 from http://www.data360.org/dsg.aspx?Data_Set_Group_Id=757

³ United States Geological Survey (2008) *Water Science for Schools*. Retrieved January 27, 2009 from <http://ga2.er.usgs.gov/edu/sq3action.cfm>

they are using their water for in comparison to other countries, and how much they are conserving or wasting compared to other countries.

Wrap Up: *What Have You Learned Today About Water?*

1. Discuss with students what they have learned about the scarcity of water. Include the following questions in your discussion:
 - a) Were you surprised by the little amount of earth's total water available to humans?
 - b) Why is it important to conserve this water?
 - c) How and why does water availability differ around the globe?
 - d) What areas did you notice that had less access to water? Which had more?
 - e) Do you think water should be more evenly distributed?
 - f) What can you do to decrease the amount of water you use? Look at your water usage worksheet - what can you take out or reduce?

Extension:

Now that your students have an understanding of the scarcity of water and the inequality of access to water, ask if they would be interested in helping to provide water resources to other areas.

1. Visit the "Adopt-A-Water-Project" section at the Global Water Network to read about other water-related projects around the world.
(<http://globalwaternetwork.org>)
2. You can also make donations through The Global Water Network to support these projects. Have your class brainstorm ways to fundraise contributions for Adopt-A-Water-Project.

CONCLUSION

After completion of this lesson, students should have a better understanding of the scarcity of water and how it is shared with everyone across the globe. They will have a better understanding of how much water is used in the United States, as well as how much they use on a personal level. They will also learn the locations of other countries and continents, and have a better understanding of other countries' water usage. Students will learn the importance of water conservation, and begin to brainstorm what they can do to help.

Name _____

What Do You Use Your Water For?

Fill in the following diagram of a measuring cup with actions you do each day that require the use of water. Make the actions that use the most water take up a large space of the measuring cup and those that use less take up a smaller space. Some examples of things to include are brushing your teeth, taking a bath, washing the dishes, using the toilet, or running the sprinkler.



Name: _____



Discover a Country

What is the name of your country? _____

What continent is your country found on? _____

What is the climate like in your country? Is it normally hot or cold?

Wet or dry? _____

Where do people get water from in your country? Is it clean water?

Give a fun fact about your country _____

